

half of the month than in the first half. Twelve stations, 8 of which are in Illinois, reported 2.50 inches or more in a 24-hour period.

Snowfall.—One of the heaviest April snowstorms on record for eastern Iowa, northern Illinois, and southern Wisconsin prevailed on the 17th and 18th. Upward of 12 inches fell over some areas and the snow was so wet and heavy that considerable damage was caused. Limbs were broken off trees, and telephone and telegraph companies suffered. The average snowfall for the district was 1.6 inches, and the greatest monthly amount, 14.5 inches, occurred at Galva in northern Illinois.

MISCELLANEOUS.

The prevailing wind direction was southwesterly, but in the Northern States it was northwesterly. The highest velocity was 48 miles an hour from the south, at Springfield, Ill., on the 25th in connection with a wind storm that caused about \$25,000 damage at that place. This equals the highest previous velocity at that station.

The percentage of the possible amount of sunshine was above the normal by about 5 per cent, the average being about 65 per cent. There was remarkable uniformity in the number of clear, partly cloudy, and cloudy days in the various parts of the district, the average of which was 12, 8, and 8, respectively. The average number of days with 0.01 inch or more precipitation was eight.

RIVERS.

High stages prevailed in most of the rivers and streams in the southern part of the district all the month. The Mississippi River was above flood stage early in the month from Keokuk, Iowa, southward. At Hannibal, Mo., the flood stage lasted to April 16, and the stage reached, 19 feet, is the highest since June, 1903. But little damage resulted at that point. The flood at Cairo, Ill., will be fully described in a special bulletin to be issued later by the Weather Bureau. Flood stages were not reached in the Mississippi River from the Davenport district northward. At the close of the month the gage readings in that district were from 2 to 5 feet lower than those reached at the time of the crest of the rise early in the month. On the 3d and 4th the ice in the Mississippi at Dubuque, Iowa, gorged at the Dubuque drawbridge, necessitating the use of dynamite. On the 3d the sheer boom was carried down stream, but lodged on the east side of the river and was recovered. The Illinois River at La Salle and Beardstown, Ill., was above flood stage throughout the month, but no damage was reported. The improved stage of water in the rivers of Minnesota was of benefit in supplying the mills with logs.

TORNADIC STORMS IN ILLINOIS.

By CLARENCE J. ROOT, Section Director.

In the late afternoon of April 21 severe and destructive tornadic storms occurred at a number of places in Illinois. There were two principal storm areas, one in the northeast part of the State and another in the south end. The distance between these two areas is about 225 miles. The reports received at this office from authentic sources place the number of dead at 18, but it is probable that all deaths have not been reported. The newspaper estimates were too high. A great many persons were injured and hundreds were rendered homeless. The property loss is probably near a million

dollars. The northern storm area covers the region extending from LaSalle and Livingston counties eastward into Indiana. An effort was made to trace a storm track, but the times given for the reports, together with the fact that so wide an area was covered, would seem to indicate that there were a number of storms operating at the same time. Reports were received from eleven parties in this district. They all agree that the storm moved in a direction north of east, that the cloud had a funnel-shaped pendant, that the storm was accompanied by rain and hail, and that there was a loud, roaring noise. The width of the paths was given from 100 feet to 1,300 feet. Some observers state that the trees fell in all directions, while others claim that they lay to the east. The losses reported are as follows: Grundy county, \$100,000; Kankakee county, \$300,000; Dwight, \$25,000; Martinton, \$10,000; Chatsworth, \$40,000. Two lives were lost in Kankakee County (Mrs. D. W. Jay and Mrs. Robert Hawkins) and three near Campus (Wilson Hulse, wife, and baby). Mr. E. G. Cryder, cooperative observer, Morris, Ill., says: "I viewed the path of this storm and the destruction was very severe. Some of the farms did not have a building left. At one place it pulled up 40 rods of wire fence. Did not leave a post standing." Mr. E. O. Welch, cooperative observer at Dwight, Ill., reports as follows: "There was no marked indication of the approaching storm at 3 p. m., but shortly after thunder was heard in the southwest increasing in volume, and at 4.10 rain began falling in a spasmodic sort of a way, with some hail. At 4.30 heavy rain was falling accompanied by large hailstones, weighing from 4 to 6 ounces, of a flat appearance and seemed to be formed by the freezing together of 10 or more smaller ones. At this time a black cloud was seen in the southwest about 2 miles from town, and it is said by those who saw it at this time to have had a funnel-shaped pendant. When I saw it myself three or four minutes later it resembled a huge column reaching from the earth to the clouds which hung very low, and appeared to be about 50 feet in diameter and was moving east-northeast, making a path about 80 rods wide. Much damage was done 2 miles south, and 3 miles southeast, two houses were entirely destroyed, a number of others badly damaged, together with outhouses and corncribs and some stock. Loss probably \$25,000 or \$30,000. Sixty-four hundredths of an inch of rain fell, most of it in about 20 minutes. At 4.50 p. m. the sun was shining. No loss of life in this immediate vicinity." The storm in Dewitt County is reported by J. F. Ziegler, cooperative observer: "The greatest damage was done near Salt Creek south of Clinton, but the storm seemed to raise and strike at times in different places. It was first reported near Rowel, 4 miles southwest of the above-mentioned place, but no great damage was done there, then at Clinton, and lastly 2 miles farther northeast, where it destroyed a building within 100 feet of my instrument shelter. The storm here (at the last place) was not as strong, or perhaps there was less in its path to show its strength."

TORNADO AT MURPHYSBORO AND BUSH, ILL., APRIL 21, 1912.

By Prof. F. H. COLYER, Cooperative Observer, Carbondale, Ill.

The storm, as a destructive one, started 3 miles north of Murphysboro, Ill., and moved slightly northeastward, about 15° to 20° north of east. In this track the funnel cloud zigzagged more or less. From reports and actual visitation I could trace the storm path something

more than 30 miles—from 3 miles north of Murphysboro to Dale, in Hamilton County. Almost all the way along the track it was destructive. In a few places the funnel cloud lifted only to lower again with increased violence. The greatest loss of life and property was at Bush, Ill., so I made this my chief place of investigation. I actually followed the track of the storm from De Soto to 1 mile beyond Bush, a distance of about 7 miles.

The storm struck Murphysboro at 6 p. m., Sunday, April 21, and it struck Bush at 6.15 p. m., thus covering 14 miles in about 15 minutes. The evidences on this point were gathered from clocks that were stopped at this hour and from several people who were just out of the danger zone and noticed the time by their watches. The destructive part of the storm did not average more than one-fourth of a mile in width, but because of shifting somewhat it was in some places wider and in others narrower.

Fully 90 per cent of the trees blown over lay to the northeast, but there were places where they lay to the southeast. In one place, where the track was the narrowest, the northeast and southeast trees had their tops touching. On the south side of the track the trees were almost invariably thrown east or northeast, while on the north edge many houses and quite a number of trees were thrown southeast.

The cloud was described by many eyewitnesses, and they were nearly a unit in saying it looked like a heavy, dark, whirling column of smoke, rising from a huge locomotive. The dark and heavy surrounding clouds were noted by many observers. Several persons who stood just outside the danger zone watched the funnel-shaped pendant for miles, and they assert that it seemed to gather at one place and then to scatter somewhat and gather again, and all noted a spiral-like motion of débris within the funnel. The funnel form was observed almost exclusively by persons just outside the zone of violent winds.

There were very large hailstones in the early stage of the violent part of the storm, being often as large as hen's eggs or larger. One person stated that 30 of these hailstones filled a gallon bucket, while about 40 hen's eggs are necessary to fill it. There was not a great deal of rain at the time of the storm and what did occur fell in a few minutes, but it was very heavy for the short time that it rained.

Most of those who observed the funnel-shaped pendant also noted the accompanying roaring noise, yet but few could think of any noise with which to compare it. Some compared it to the muffled roar of an onrushing train, while others said that they had never before heard any other noise just like it.

All dwellings in the town of Bush, with one or two exceptions, belong to the Western Coal & Mining Co., and as a rule they were not securely built. Most of them rested on wooden block foundations and were open underneath. So far as I could observe no storm sheathing was used; and as a result only 25 of the 148 dwellings were uninjured, and these were outside the path of the storm. Twenty-two houses were completely destroyed, 63 partially so, while 43 were slightly damaged. In most cases patches of roof were torn off or the houses were moved off their foundation, otherwise not being seriously injured. The company estimates its loss at not less than \$100,000 and the loss to the occupants of the houses at \$25,000. The railroad roundhouse was destroyed; the section foreman's house was a complete wreck; and cars were damaged, entailing a loss of not less than \$25,000 additional, making a total loss of

\$150,000, based upon the estimate of two officers of the coal company. The loss to farm property between Murphysboro and Bush, including houses, barns, and other buildings, stock, and fencing, amounts to \$50,000. About 25 farmers sustained severe losses, while minor losses occurred on other farms. In some cases both house and barn were destroyed, while in others only the house or the barn was seriously damaged.

The death list totals 9, while 75 were injured.

A second tornado occurred at Willisville, 26 miles north of Murphysboro, on the same day, resulting in the death of three persons, and a third storm of like character occurred 6 miles north of Murphysboro the same evening. No details of these can be given.

TORNADO NEAR CARBONDALE, ILL.

By Prof. F. H. COLYER, Cooperative Observer, Carbondale, Ill.

So far as I can find out the storm began about 4 miles west of Carbondale and extended about 28 miles almost due east into Williamson County. It was most destructive in and near Carbondale. It has been impossible for me to find out just how far east the storm extended as a destructive wind.

The storm occurred in Carbondale at 1.45 p. m., Friday, April 26. The exact time it occurred at other places along the line I can not find out, but here in Carbondale we had over 700 students in the normal school and many of us looked at our watches and at the clocks, so we knew the exact time.

The general direction of the whole storm was almost due east, but winds both from northwest and southwest met along a narrow belt, where the storm was most destructive. The evidences of these lateral winds from the northwest and southwest are very clear. In the first place all buildings and trees thrown down on the north side of the line of meeting of these winds are lying to the southeast, while all buildings and trees on the south side of this line are thrown to the northeast. In the second place, I watched the clouds, and there evidently were two sets of clouds that met along an east and west line. The meeting of these was seen by a number of persons.

The width of the destructive area varies considerably owing to the degrees of violence of the lateral winds. As a rule the most destructive track was not over 400 or 500 feet wide, but barns were blown down over a much wider area; but these were destroyed by the force of the lateral winds, which came in with great violence.

For an hour or so previous to the storm a mass of deep black clouds lay to the north. A short time before the storm a heavy mass of clouds rose in the west and southwest from which came quick, short, and deep thunder. Directly in front of these last-named cloud masses there quickly developed what appeared to be a severe thunder squall, with clouds moving rapidly from the northwest and southwest. At their meeting the clouds appeared to roll and boil, and after a few quick but deep peals of thunder the storm struck us. It grew so dark, and flying obstacles so obscured everything that nothing more could be distinctly seen till the worst of the storm was over. I looked for the funnel cloud, but could see none.

Almost at the same instant that the furious wind struck us very large hailstones fell, but the hail lasted only a short time, giving place to rain. It rained hard for a short time only. For the 24 hours previous to the violent storm we had 3 inches of rainfall from a series of thunderstorms.